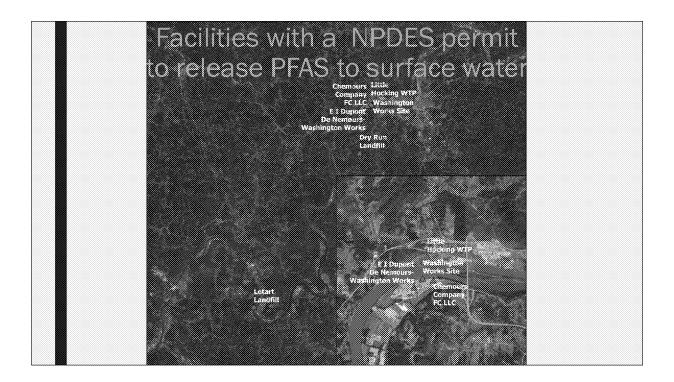


Groundwater was treated with GAC filtration, not all homes/private wells required GAC filtration Bed1 vs. Bed2

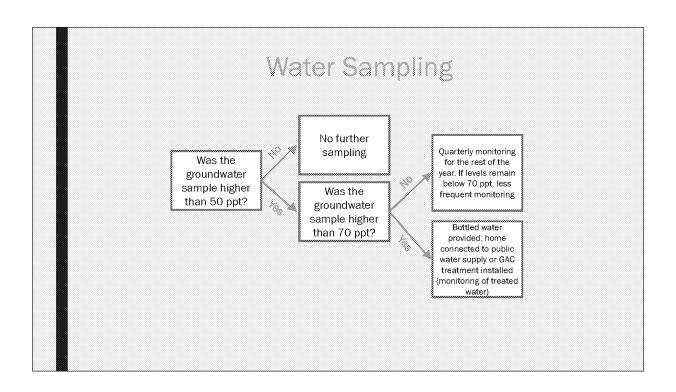
Tissue samples= tomatoes, peppers, beans, cucumbers, hay, beef GenX 2/3 of samples taken after treatment

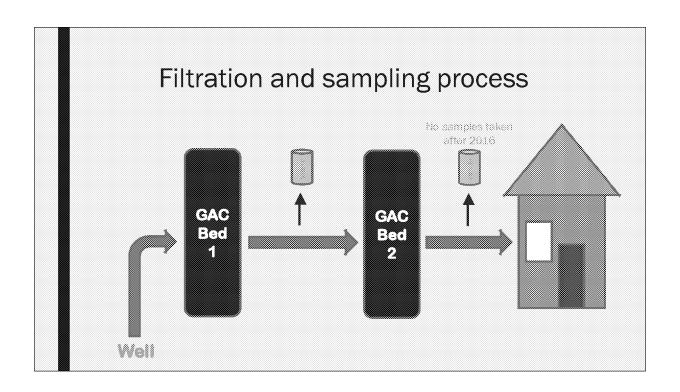
The furthest point is about 45 km to the southwest of the Washington Works facility.

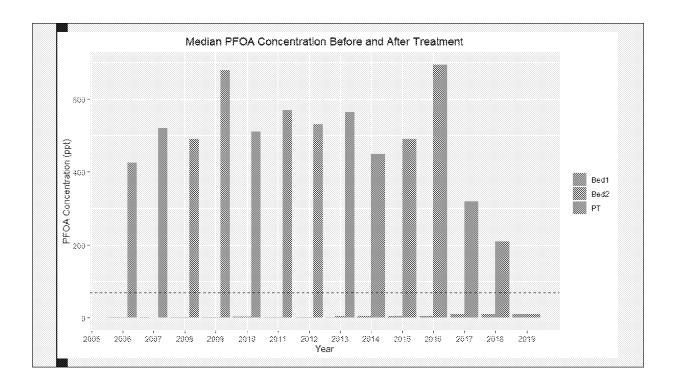


These facilities are required to monitor their discharge into rivers and streams. There are six facilities within the study site, three of which are in the Washington Works facility. Two are landfills associated with DuPont and Chemours. One is the Little Hocking Water Treatment Plant, which is to the West of Washington Works, across the Ohio River.

Make the points and text larger so that it's more readable. Maybe, delete or move title. Add Ohio River and tributaries. Make the inset map much larger

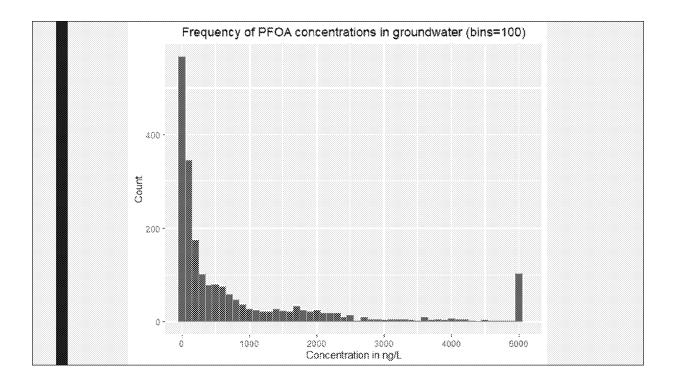






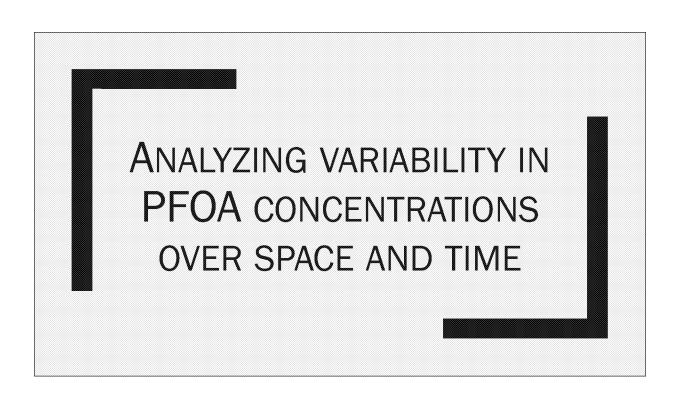
Samples without a PT, Bed1 or Bed2 that are also taken from source groundwater were not included. Only those samples taken in homes with PFOA-contaminated water at a high enough concentration to get a GAC filtration system are included here, causing the median to be a little higher than the median for all source water samples. Also, there are some very high outliers in this dataset, which is why I chose to plot the median and not the mean

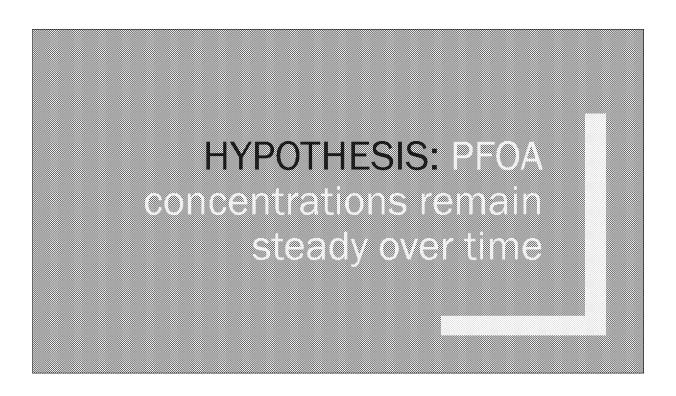
http://www.sthda.com/english/wiki/ggplot2-error-bars-quick-start-guide-r-software-and-data-visualization

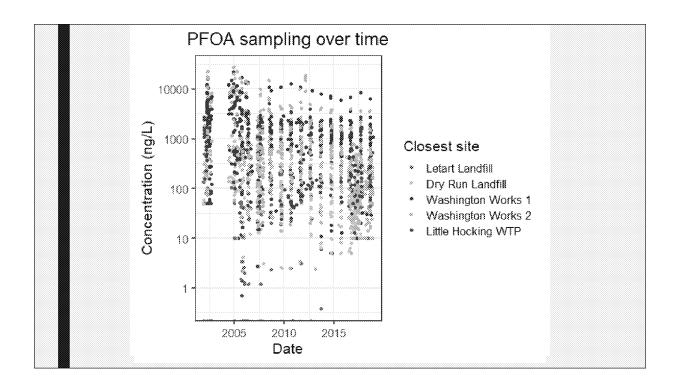


While the bin with the highest count is obviously the 0-50 bin (which would warrant no further surveillance so those locations might be underrepresented compared to tainted wells that are being sampled year after year), it is disturbing that 75% of the samples of untreated groundwater are over 50 ppt, which is still ~3 times higher than some state health advisories or regulations.

I excluded some higher concentrations because they made the graph too hard to read

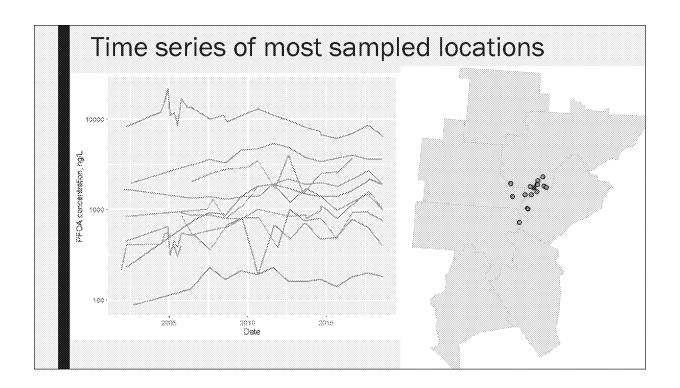




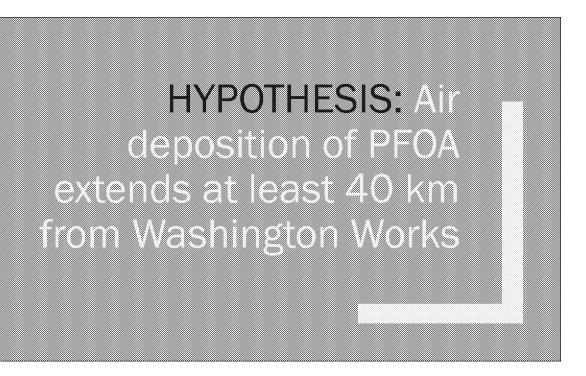


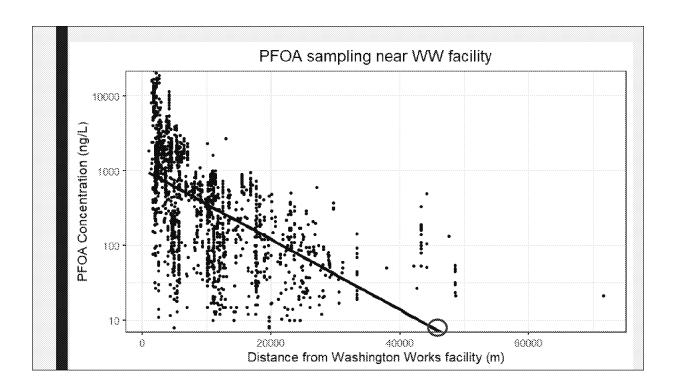
Highest values have come down by about half Average values for each year:

^{*}can color these points by which NPDES DMR site they are nearest "green", "mediumspringgreen", "firebrick1", "darkorange3", "deepskyblue"

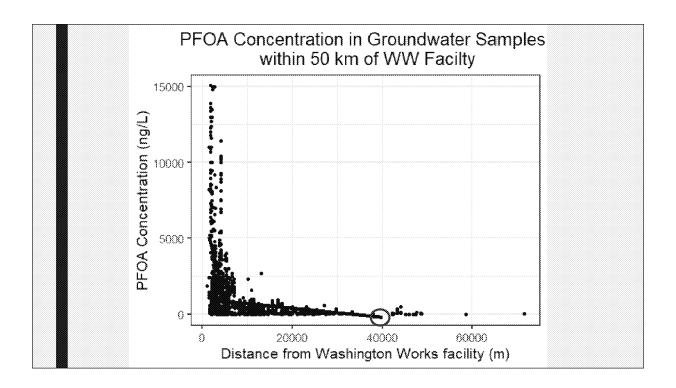


Farthest point is ~17.5 km from WW, most are relatively high All of these are the most sampled locations, highest is over 100 times total (including both pre-treatment and post-treatment)



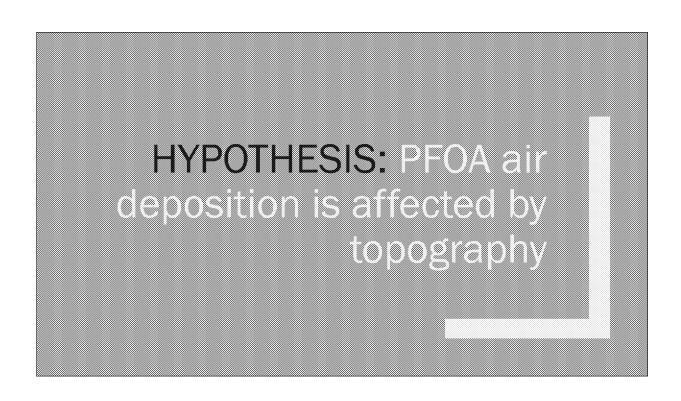


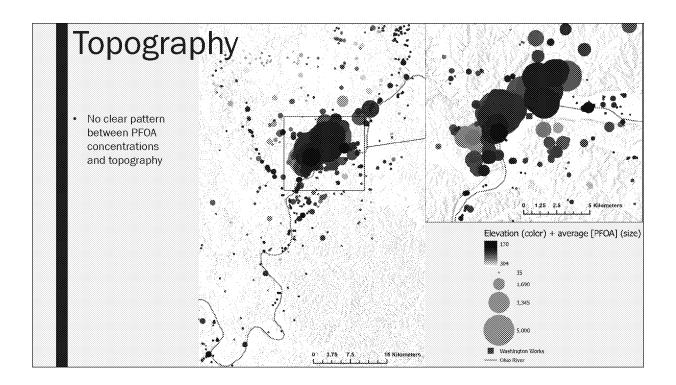
*non-detects removed here



Segmented regression; breaking point at 4950 m, almost 5 km

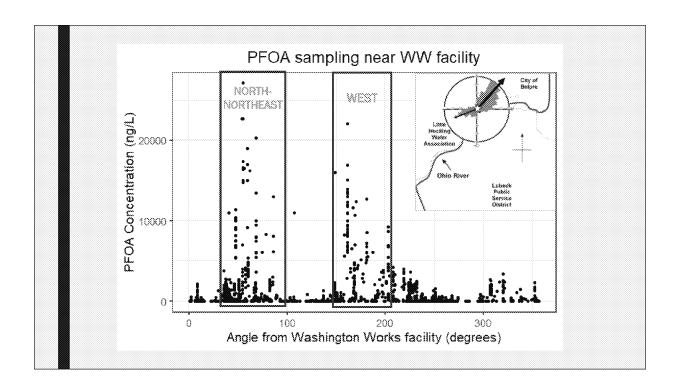
*non-detects also removed here





The areas highest in elevation are to the East and West and aren't captured on this map. Elevation is in meters above sea level.

HYPOTHESIS: Groundwater PFOA concentrations are highest in the direction of prevailing winds

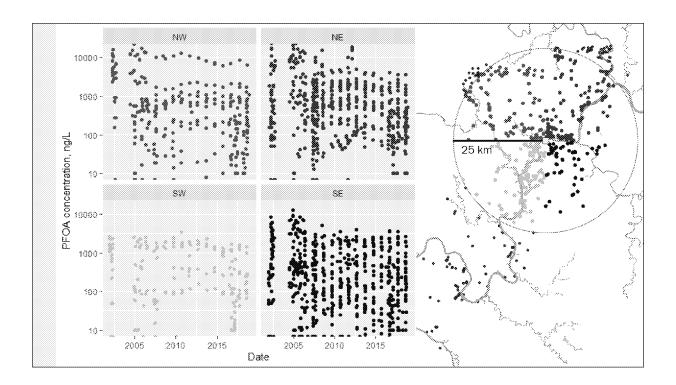


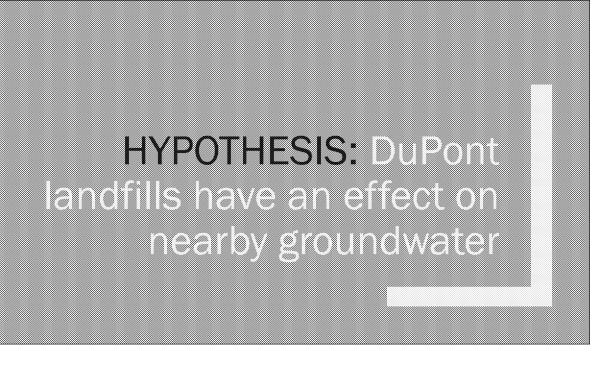
Significant spikes to the North-Northeast and West

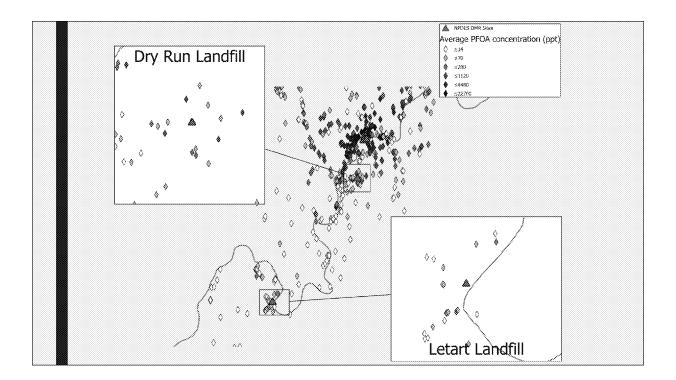
Report said that prevailing wind blows towards the Northeast, but when this wasn't the predominant wind direction, it was most commonly blowing towards the West-Southwest

Directly to the West of the facility the wells are also the closest downstream to Washington Works facility (maybe impacted by groundwater recharge by the Ohio River)

Image from Paustenbach et al., 2007 report



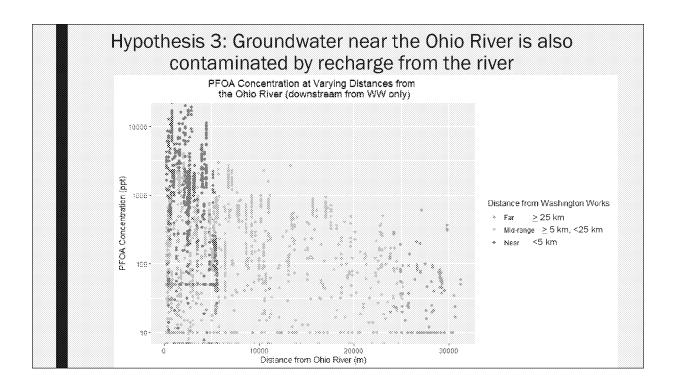




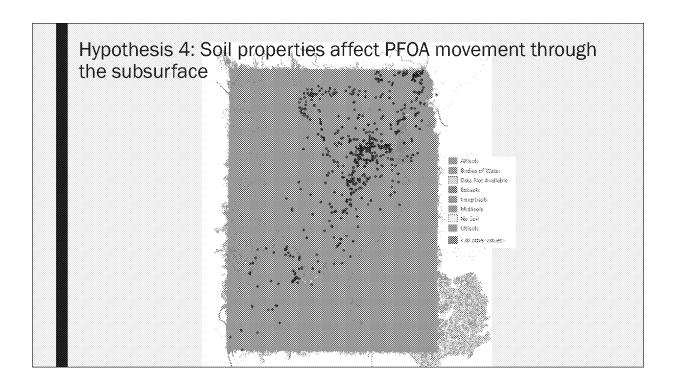
Proximity to the river and the main Washington Works site makes these maps more confusing.

However, we might expect air deposition to not affect the area surrounding these two landfill sites because of the distance from the Washington Works site (especially for Letart Landfill) and because of direction from Washington Works (Dry Run is South of WW, so prevailing winds do not blow that direction)

HYPOTHESIS: Wells near the Ohio River are contaminated through groundwater recharge



Wells really close to the Ohio River will have higher concentrations than those farther away, although air deposition and distance from WW will still play a role.



Soil correlates with topography and landforms.

In general, soils with more organic matter are more likely to retain more PFAS than soils with less organic matter.

Soil orders (from Soil Science Society of America and Wikipedia)

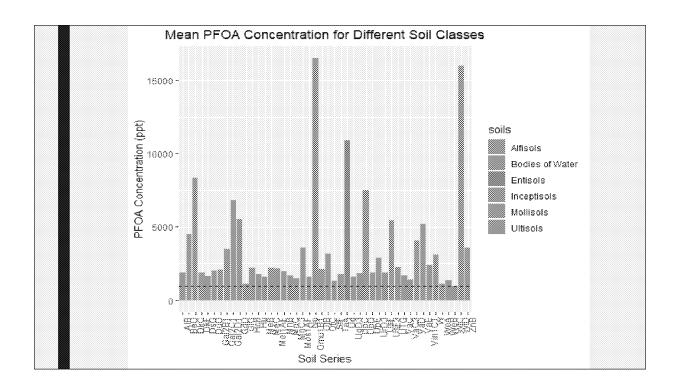
Alfisols- only moderate leaching, dominant in the Ohio River Basin, productive soils that are conducive to agriculture and forestry

Entisols- often found on active floodplains, deposition is greater than soil development, only a top soil layer (no other horizons have formed)

Inceptisols- these soils develop quickly from alteration of parent material, no signification accumulation of clay or organic matter

Mollisols- these soils are dark and rich in organic matter, mostly because of the grasslands most commonly on the surface whose roots add organic matter to the subsurface

Ultisols- read clay soils with no organic material, typically deficient in nutrients below the first several centimeters, intensely weathered and very acidic

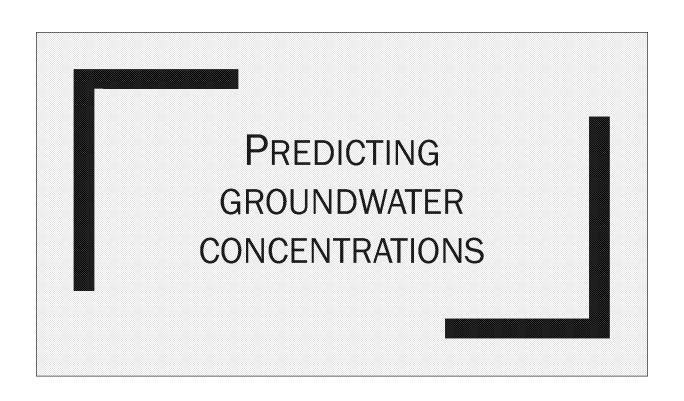


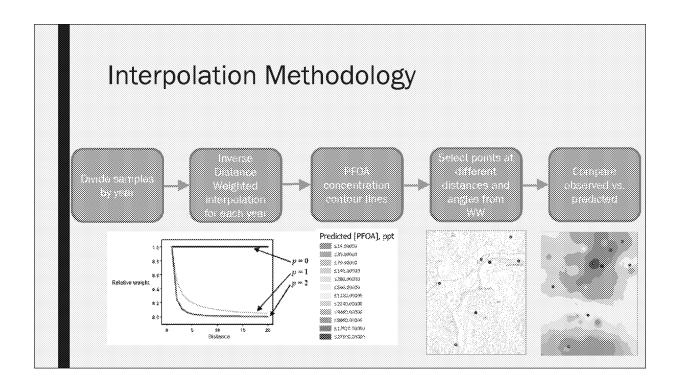
The majority of samples were taken from areas considered alfisols

Narrowed it down to samples taken that had concentrations over 1,000 ppt (where the dotted line is)

There was at least one high sample taken from each soil order

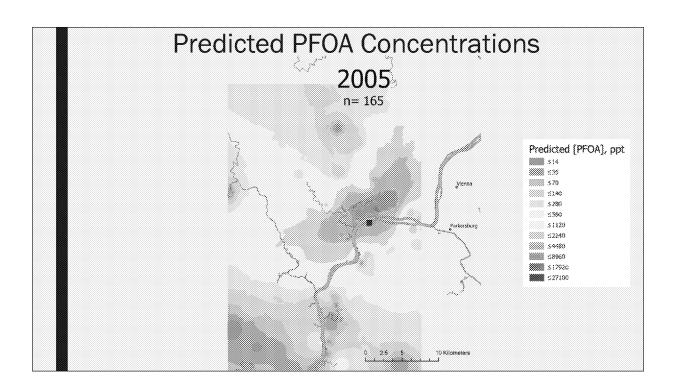
Alfisols are leached basic or slightly acidic soils; while they are the most represented here and in all samples

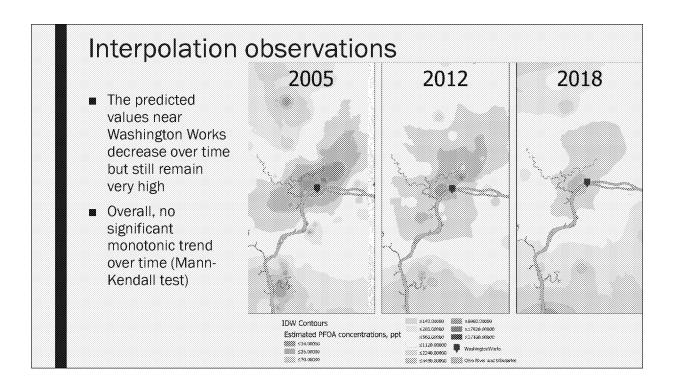




2001 to 2018 for PFOA, 2001 was too small to create interpolation for and 2003 there were no samples so also no interpolation done

The closer a cell is to another point, the greater the weight is given to that value when calculating the predicted Created the PFOA concentration contour lines based on values that have been used for state regulations and





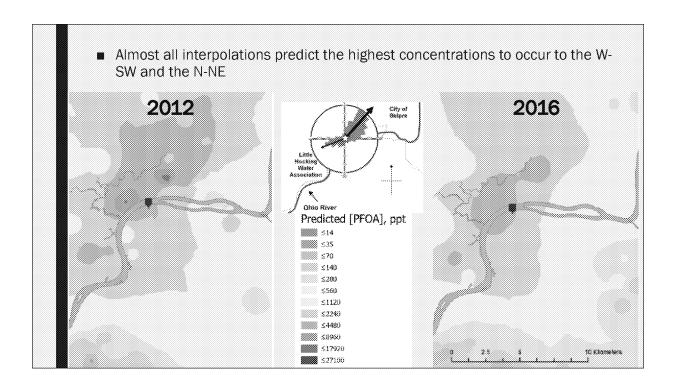
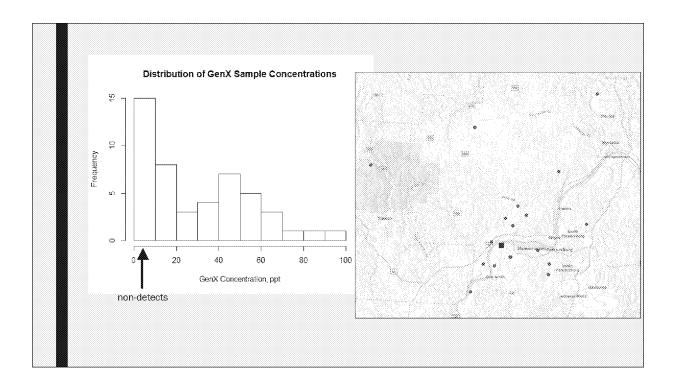
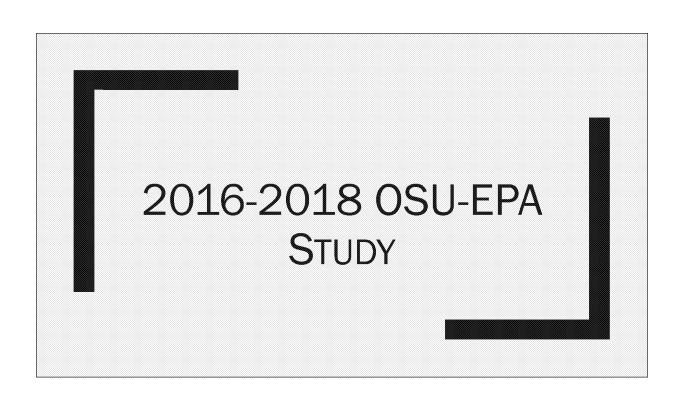


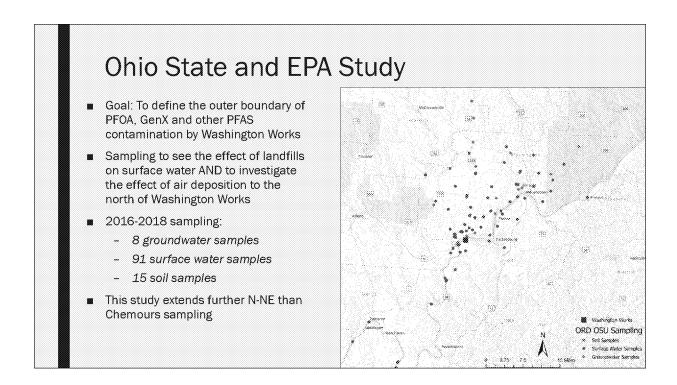
Image from Paustenbach et al., 2007



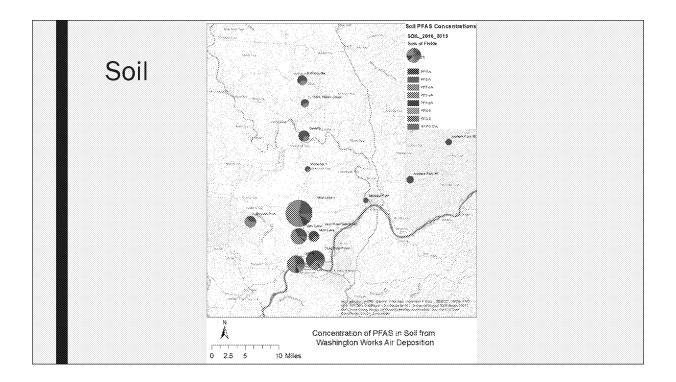


GenX samples are only from 2018 and 2019

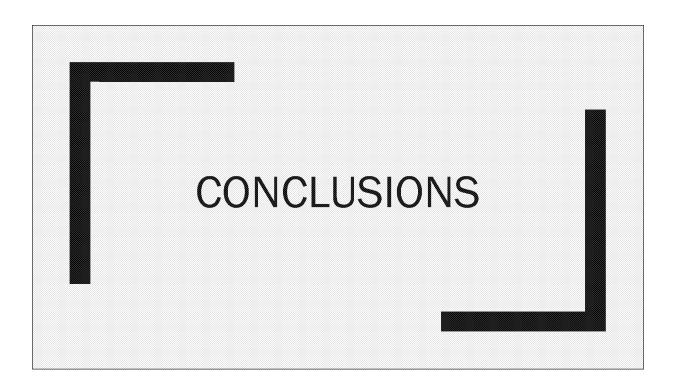




Very few groundwater samples were taken so those aren't included here- only PFOA found in two samples.



Concentrations range from total PFAS of ~5 ppt to ~90 ppt. The highest concentrations of a single analyte were found in PFPeA but PFOA was found most frequently (PFPeA isn't found in the most NE samples).



There were four fish sampling locations within the study area

Limitations

- No wind/air sampling data
- Limited GenX sampling
- Many confounding factors
- Spatial interpolation methods do not predict concentrations outside of sampling boundaries

This would've been interesting since PFOA hasn't been released for some time-> Weber et al., 2017 methodology to better understand PFOA movement into and through groundwater